REMARKS

Reconsideration of the application in view of the above amendments and the following remarks is requested.

In accordance with 37 CFR 1.121, the claims which are being currently amended are presented with markings to indicate the changes that have been made relative to the immediate prior version.

Specification

The Examiner indicated that the specification did not provide an antecedent basis for "each said component is rigid and substantially non-resilient", as indicated in claims 4, 13, and 21 on file. Also, the Examiner indicated that the specification does not provide an antecedent basis for "each said component has a predetermined stiffness" as provided in claims 13 and 18 on file.

In the enclosed amended claims, the phrase "rigid and substantially non-resilient" has been deleted from claims 4, 13, and 21. Also, "each said component has a predetermined stiffness" has been deleted from enclosed amended claims 13 and 18.

Claim Rejections - 35 U.S.C. §112

The Examiner indicated that the following were contraventions of 35 U.S.C. §112:

> "each said component is rigid and substantially non-resilient" as set forth in claims 4, 13, and 21 on file;
> "each said component has a predetermined stiffness" as set forth in claims 13 and 18 on file; and
> claims 4 – 6 and 9 on file were rejected as being indefinite because they included a reference to "each side constituent".

As noted above, the first two points were addressed by deleting the wording in question from claims 4, 13, and 21 and claims 13 and 18. With respect to the last point, "side" in claim 4 on file was a typographical error, and it has been amended to "said" accordingly.

Claim Rejections - 35 U.S.C. §102(b)

Claims 4 – 6, 13 – 15, 18 – 19, and 21 – 22 were rejected under 35 U.S.C. §102(b) as being anticipated by U.S. patent application no. 09/975,196, published as U.S. 2002/0081956 (Bennett et al.). The Examiner indicated that:

> Bennett et al. teaches a machine tool in the form of a polishing device (see paragraph 0006 for example). An isometric view of such a polishing device is shown in Figure 1, wherein 60 is a multi-head carousel including a plurality of carrier heads 100 on which workpieces 10 to be polished are mounted (see Figure 1). Also, on tabletop 23 are located a plurality of polishing stations 25a-c, each mounting a circular polishing pad 32 (Figure 1).
>
> Of particular interest is the embodiment of Bennett's invention shown in Figure 3, which shows a detailed cross-sectional view of a carrier head as in Figure 1, and including a retaining ring (see paragraphs 0020-0022).
>
> Note that the carrier heads 100 can be considered "components" as set forth in the claims. Broadly speaking, these carrier heads or "components" must "cooperate with" each other in order to function properly to ensure polishing of the workpiece, e.g., at least cooperate by operating in the proper sequence, etc.
>
> As shown in Figure 3, note that rigid rings 203 and 184 are considered "constituent parts", between which, in what is broadly considered a "slot" or "aperture", is sandwiched planar PVC damping material 200 (paragraphs 0041 and 0032).

The Applicant's invention is directed to a machine tool in which, when operating, vibration is much reduced. The stresses to which a metal workpiece must be subjected when subjected to the operations performed by a machine tool (described in paragraph 0001 of the application herein) are very large, but the work done on the workpiece must be completed to a very high degree of accuracy. As indicated in paragraphs 0004-0006 of the Applicant's application, in the prior art, a machine tool is made of monolithic components or parts (typically castings) which are formed as large as possible, based on the theory that the larger the component, the better the component's vibration-dissipating characteristics. Also, in the prior art, it was thought that each component had to be integrally formed, so that the component would withstand the large stresses imposed without any internal slippage or other undesirable movement during operation, which would adversely affect accuracy.

In contrast, in the Applicant's invention, a component includes at least two constituent parts and the damping material therebetween. However, because movement of the constituent parts and/or the damping material relative to each other would be unacceptable, holes are formed in the damping material, the holes being aligned with corresponding holes in the constituent parts, for receiving bolts which are tightened sufficiently to prevent movement of the constituent parts relative to each other and/or the damping material relative to either of the constituent parts or vice versa. At this point, no other practical means for fastening the constituent parts to each other with the damping material between them (and physically separating the constituent parts) which is sufficiently strong to withstand the very large stresses imposed during operation of the machine tool has been invented by the inventor.

In the enclosed amended claims, the features of the preferred embodiment which hold the constituent parts in position relative to each other (and which hold the damping material in position relative to the constituent parts and vice versa) have been added to amended claims 4, 13, 18, 21, and 22. These features are described in paragraph 0029 of the Applicant's application. No new matter has been added.

Also, amended claims 4 and 13 includes the limitation that the sheet is "interposed between said at least two constituent part to prevent said at least two constituent parts from contacting each other". The underlined portion is new, and support for it can be found in paragraph 0025 of the application herein. This wording emphasizes the structure of the Applicant's invention. The separation of the constituent parts from each other by a very thin layer of hard, polished PVC or similar material provides a surprising result, in that the reduction in vibration is substantial. Because the damping material is relatively thin and hard, and because of the manner in which the constituent parts and the damping material are fastened together, the risk of slippage within a component is relatively low.

In paragraph 0041 of the Bennett et al. reference are the following statements:

> The upper portion 203 is attached to the middle portion 184 through a damping material 200, which is similar in thickness and is made from the same material as the damping material 230 of FIG. 2. . . . Pressure sensitive adhesive 202 adheres the damping material 200 to the middle portion 184.

In Bennett et al., therefore, adhesive (201, 202) is sufficiently strong to hold the damping material 200 in position between the upper portion 203 and the middle portion 184. Also, the middle portion 184 can be secured to the lower portion 180 by a layer of epoxy adhesive 186 (paragraph 0041).

The device disclosed in Bennett et al. is used in chemical mechanical polishing (see paragraphs 0002-0006). In chemical mechanical polishing (also referred to as chemical mechanical planarization), very small amounts of material are removed from an integrated circuit at certain points in the process of manufacturing the integrated circuit. (A paper entitled "Introduction to Chemical Mechanical Polishing" (http://shira.iic.kyoto-u.ca.jp/lecture_notes/plasma-process/CMP-lecture-Note.pdf, at June 3, 2005) is enclosed, for the Examiner's information.) The mechanisms involved in chemical mechanical polishing are both chemical and mechanical. The pressure exerted upon the workpiece

(i.e., the partially-formed integrated circuit) is relatively low. For example, in "Chemical Mechanical Planarization" (SIMTech Technical Report PT/01/003/JT, enclosed), a reference is made to an over-polishing effect which occurred when head pressure was about 150g/cm^2, i.e., about 2 psi. Presumably, adhesive is used in Bennett et al. because the device disclosed in Bennett et al. is used in chemical mechanical polishing, in which relatively low pressures are exerted on a partially-formed integrated circuit workpiece.

In view of the very large stresses to which a machine tool is subjected, the structure disclosed in paragraph 0029 of the application herein is thought to be necessary. The Applicant therefore submits that the Applicant's invention is distinguishable over the device disclosed in Bennett et al. on the ground that Bennett et al. does not disclose a damping material with holes in it, nor does Bennett et al. disclose parts corresponding to constituent parts with holes in them for receiving fasteners connecting the constituent parts with each other, and maintaining the constituent parts and the damping material in position relative to each other.

In Bennett et al., the damping material (230) is described as follows (paragraph 0032):

> Generally, the damping material has significantly better vibration damping characteristics than both adjacent parts of the polishing apparatus, which are typically made from stiff materials, e.g., metals. The damping material can be a viscoelastomer with little or no memory so as to provide good vibration damping characteristics. In general, the damping material can be a material that absorbs vibrational energy and dissipates it as heat. The damping material can be a soft polymeric material, such as a polyvinyl chloride (PVC). A suitable damping material is Isodamp C-1002, which is manufactured by EAR Specialty Composites . . . alternatively, the damping material can be a hard polymer . . .

However, in paragraph 0054 of Bennett et al., further requirements of the damping material are specified:

> Any material that does not rebound to its original shape when deformed may be used as a damping material. . . . The damping material should rebound by less than ten percent of the deformation . . .

Also, the following comments are provided in paragraph 0055 of Bennett et al. regarding the thickness of the damping material:

> A thicker damping material may be used to improve the vibration damping, although poor control of the relative motion of the substrate and the polishing pad may result from a damping material that is too thick. A thinner damping material may also be used, although if the damping material is too thin, it may not sufficiently reduce or prevent the transmission of vibrational energy.

As is well known, PVC is available in various forms. The PVC referred to in Bennett et al. is apparently a relatively "soft" form. The material referred to specifically – Isodamp C-1002 – has a tensile strength of 1,574 psi. (A "Materials Summary Sheet" provided by EAR Specialty Composites is enclosed.) In contrast, the damping material is a hard polished PVC, which typically has a tensile strength of about 6,500 psi. (Information about rigid polyvinylchloride (entitled "Indian Plastic Portal") is enclosed.)

In addition, the thickness of the damping material (230) in Bennett et al. is described in paragraph 0034 of Bennett et al. as being "about 0.06 inches thick". (The damping material (200) is described in paragraph 0041 as being "similar in thickness . . . as the damping material 230 . . .".)

In contrast, the thickness of the damping material is described in the Applicant's application as between 0.01 inch and 0.02 inch (paragraph 0029). Accordingly, claim 6, as amended, is thought to be patentable over Bennett et al., as the thicknesses are substantially different. The thickness of the damping material is a limitation which has

also been added to amended claims 13, 18, and 22 to further distinguish the invention as defined in those claims over the device disclosed in Bennett et al.

The Applicant also submits that the preambles in amended independent claims 4, 13, and 18 should be considered to be a limitation. This is because the preambles in these three claims each provide a distinct definition of the claimed invention's limitations, since these three amended claims refer to "a machine tool for performing a machine tool function", and "machine tool function" is defined in paragraph 0002 of the application. "Components" are also defined in paragraph 0002 in terms of the machine tool functions performed.

In particular, the Applicant submits that, because amended claim 18 is a method claim, amended claim 18 has application to a machine tool, rather than (for example) to any type of apparatus generally. This is because the invention as defined in amended claim 18 only has meaning and vitality, in the Application's submission, if the preamble is understood as a limitation.

In view of the foregoing, the Applicant submits that amended independent claims 4, 13, 18, 21, and 22 are not anticipated by Bennett et al. Claims 5 and 9 are also thought to be patentable, as it is dependent on claim 4.

Also, because amended claim 13 is thought to be patentable, dependent claims 14, 15, and 17 are also now thought to be patentable. Similarly, claims 19 and 20, which are dependent on claim 18, are thought to be patentable because claim 18 is thought to be patentable.

Claim Rejection – 35 U.S.C. §103(a)

The Examiner also indicated that claims 9, 17, and 20 were rejected under 35 U.S.C. §103(a) as being unpatentable in view of Bennett et al.

As noted above, the device disclosed in Bennett et al. is for chemical mechanical polishing. As indicated in Mr. Zoran's enclosed declaration, chemical mechanical polishing appears to involve very light pressure (generally, up to approximately 3 to 4 psi) as well as a polishing action involving chemical reactions on an integrated circuit typically comprising, for example, silicon (and other materials), the polishing and chemical reactions taking place during the process of forming the integrated circuit. In contrast, the stresses to which a workpiece is subjected in a machine tool would amount to several million psi, as described in Mr. Zoran's declaration.

In Bennett et al. (and as noted above), the damping material is required to be deformable, and to stay deformed (paragraph 0054):

> Any material that does not rebound to its original shape when deformed may be used as a damping material. Specifically, when subjected to a deformation, the damping material should rebound by less than ten percent of the deformation, although a rebound of less than six percent of the deformation is preferred.

In contrast, in the Applicant's invention, the extent to which the damping material is deformable is necessarily minimized (if not effectively eliminated), due to the adverse effect on the required accuracy which any appreciable deformation of the damping material would cause. A damping material which is significantly deformable and which stays deformed to an extent would be unacceptable in a machine tool because it would adversely affect the accuracy required of the machine tool. Because of this need, the damping material included in the Applicant's invention is as thin as is practical. As noted above, a surprising result is that reductions in vibrations have been achieved with very thin layers of hard damping material.

Accordingly, the Applicant submits that the Bennett et al. reference is not reasonably pertinent to the particular problem with which the inventor herein, Mr. Zoran, was concerned. The Applicant submits that one skilled in the art of machine tools would not

consider Bennett et al., as Bennett et al. is focused on chemical mechanical polishing, which differs substantially in its nature from machine tool functions and includes a damping material which does not rebound to its original shape. Accordingly, the Applicant therefore submits that the claims 9, 17, and 20 are not obvious in view of Bennett et al.

The Commissioner is authorized to charge the applicable fees to the Applicant's agent's account, Deposit Account No. 501613.

On the basis of the enclosed documents and the foregoing remarks, reconsideration of this application and its early allowance are requested.

Respectfully submitted,
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